

What is claimed is:

1. A single increment initiator charge comprising:

a homogeneous blend including:

zirconium;

an oxidizer; and

a combustion enhancer,

wherein the combustion enhancer is present in the homogeneous blend in an amount effective to result in the single increment initiator charge being effective to ignite an associated pyrotechnic composition.

2. The single increment initiator charge of claim 1 wherein the homogeneous blend includes at least about 20 composition weight percent of zirconium.

3. The single increment initiator charge of claim 1 wherein the homogeneous blend includes at least about 25 composition weight percent of zirconium.

4. The single increment initiator charge of claim 1 wherein the homogeneous blend includes at least about 30 composition weight percent of zirconium.

5. The single increment initiator charge of claim 1 wherein the oxidizer is selected from the group consisting of potassium perchlorate, potassium chlorate, potassium nitrate, aluminum oxide, magnesium nitrate, magnesium perchlorate, and combinations thereof.

6. The single increment initiator charge of claim 1 wherein the oxidizer comprises potassium perchlorate.

7. The single increment initiator charge of claim 1 wherein the homogeneous blend includes at least about 30 composition weight percent of an oxidizer.

8. The single increment initiator charge of claim 1 wherein the combustion enhancer is selected from the group consisting of metallic combustion enhancers, organic combustion enhancers, and combinations thereof.

9. The single increment initiator charge of claim 1 wherein the combustion enhancer comprises a metallic combustion enhancer selected from the group consisting of titanium hydride, aluminum, aluminum hydrides, copper, copper oxides, magnesium, magnesium hydrides, titanium, zirconium hydride, beryllium, and combinations thereof.

10. The single increment initiator charge of claim 1 wherein the combustion enhancer comprises an organic combustion enhancer including guanidine nitrate.

11. The single increment initiator charge of claim 1 wherein the combustion enhancer comprises titanium hydride.

12. The single increment initiator charge of claim 1 wherein the homogeneous blend includes at least about 10 composition weight percent of combustion enhancer.

13. The single increment initiator charge of claim 1 wherein the homogeneous blend includes:

about 20 to about 60 composition weight percent of zirconium;

about 30 to about 75 composition weight percent of oxidizer; and

about 10 to about 40 composition weight percent of combustion enhancer.

14. The single increment initiator charge of claim 12 wherein the homogeneous blend includes:

potassium perchlorate oxidizer and titanium hydride combustion enhancer.

15. A method for making a single increment initiator charge for use in an inflator device for an inflatable restraint system the steps of:

preparing a homogeneous blend including:

zirconium;

an oxidizer; and

a combustion enhancer in an amount effective to result in a single increment initiator charge being effective to ignite an associated pyrotechnic composition;

loading the homogeneous blend into a charge holder; and

compressing the homogeneous blend to form a single increment initiator charge.

16. The method of claim 15 wherein the zirconium, the oxidizer, and the combustion enhancer are dry-blended to form the homogeneous blend.

17. The method of claim 15 wherein the zirconium, the oxidizer and the combustion enhancer are mixed with a solvent to form the homogeneous blend.

18. The method of claim 17 further comprising the step of centrifuging the homogeneous blend to remove air entrained during mixing.

19. The method of claim 17 further comprising the step of drying the homogeneous blend to remove the solvent and form a dry homogeneous blend.

20. The method of claim 17 wherein the solvent includes an alcohol selected from the group consisting of isopropyl alcohol, n-propyl alcohol, and combinations thereof.

21. The method of claim 15 wherein the homogeneous blend includes at least about 20 composition weight percent of zirconium.

22. The method of claim 15 wherein the homogeneous blend includes at least about 25 composition weight percent of zirconium.

23. The method of claim 15 wherein the homogeneous blend includes at least about 30 composition weight percent of zirconium.

24. The method of claim 15 wherein the oxidizer comprises potassium perchlorate

25. The method of claim 15 wherein combustion enhancer comprises titanium hydride.

26. The method of claim 15 wherein the homogeneous blend includes:

about 20 to about 60 composition weight percent of zirconium;

about 30 to about 75 composition weight percent of potassium perchlorate oxidizer; and

about 10 to about 40 composition weight percent of titanium hydride combustion enhancer.

27. The method of claim 15 wherein the homogeneous blend is compressed to a dry density of about 50 percent to about 95 percent of theoretical density.

28. A single increment initiator charge prepared by a process comprising:

forming a homogeneous blend including:

zirconium;

an oxidizer; and

a combustion enhancer in an amount effective to result in a single increment initiator charge being effective to ignite an associated pyrotechnic charge;

loading the homogeneous blend into a charge holder; and

compressing the homogeneous blend to form the single increment initiator charge.

29. The single increment initiator charge of claim 28 wherein the zirconium, the oxidizer, and the combustion enhancer are dry-blended to form the homogeneous blend.

30. The single increment initiator charge of claim 28 wherein the zirconium, the oxidizer, and the combustion enhancer are mixed with a solvent to form the homogeneous blend.



31. The single increment initiator charge of claim 30 wherein the solvent comprises an alcohol selected from the group consisting of isopropyl alcohol, n-propyl alcohol, and combinations thereof.

32. The single increment initiator charge of claim 30 wherein the homogeneous blend is centrifuged to remove air entrained during mixing.

33. The single increment initiator charge of claim 30 wherein the homogenous blend is dried prior to compression to remove the solvent.

34. The single increment initiator charge of claim 28 wherein the oxidizer is selected from the group consisting of potassium perchlorate, potassium chlorate, potassium nitrate, aluminum oxide, magnesium nitrate, magnesium perchlorate, and combinations thereof.

35. The single increment initiator charge of claim 28 wherein the combustion enhancer is selected from the group consisting of metallic combustion enhancers, organic combustion enhancers, and combinations thereof.

36. The single increment initiator charge of claim 28 wherein the combustion enhancer comprises a metallic combustion enhancer selected from the group consisting of titanium hydride, aluminum, aluminum hydrides, copper, copper oxides, guanidine nitrate, magnesium, magnesium hydrides, titanium, zirconium, zirconium hydride, beryllium, and combinations thereof.

37. The single increment initiator charge of claim 28 wherein the combustion enhancer comprises an organic combustion enhancer including guanidine nitrate.

38. The single increment initiator charge of claim 28 wherein the homogeneous blend includes:

- about 20 to about 60 composition weight percent of zirconium;
- about 30 to about 75 composition weight percent of oxidizer; and
- about 10 to about 40 composition weight percent of combustion enhancer.

39. The single increment initiator charge of claim 38 wherein the homogeneous blend includes:

about 25 to about 35 composition weight percent of zirconium;

about 50 to about 60 composition weight percent of potassium perchlorate oxidizer; and

about 10 to about 25 composition weight percent of titanium hydride combustion enhancer.

40. The single increment initiator charge of claim 28 wherein the homogeneous blend is compressed to a dry density of about 50 to about 95 percent of theoretical density.